A REVIEW OF THE GENERA *ROENTGENIA* AND *POTAMOGANOS* (BIGNONIACEAE)[1,2]

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ABSTRACT

Roentgenia and *Potamoganos* (Bignoniaceae) are small genera of lianas with "*Cydista*-type" corollas that are closely related to larger and more well known genera such as *Cydista*, *Clytostoma*, and perhaps *Phryganocydia*. *Roentgenia* is ditypic, containing *R. bracteomana* and *R. sordida*, whereas *Potamoganos* is monotypic, containing only *P. microcalyx*. The two species of *Roentgenia* have white to lavender, campanulate-funnelform, *Cydista*-type corollas, stems with eight phloem arms, bi-trifid tendrils, 3(–4)-colpate pollen with reticulate exine, 2-seriate ovule organization, nectariferous disk lacking, linear-oblong fruit, and winged seeds. *Roentgenia bracteomana* is distributed from southern Colombia to northern Bolivia and north-central Brazil, whereas *R. sordida* is restricted to eastern Venezuela, Guyana, Suriname, French Guyana, and portions of northern Brazil. *Potamoganos microcalyx* has lavender to magenta, campanulate-funnelform, *Cydista*-type corollas, with four phloem arms, trifid tendrils, 3-colpate pollen with reticulate exine, 4-seriate ovule organization, and a nectariferous disk. *Potamoganos microcalyx* is known from southern Venezuela, Guyana, Suriname, and northernmost Brazil. A key to species, maps of species distributions, reproductive phenology, and illustrations of *R. bracteomana* and *P. microcalyx* are provided.

Key words: Bignoniaceae, Bignonieae, *Cydista*, *Potamoganos*, *Roentgenia*.

Roentgenia (K. Schum. ex Sprague) Urb. and *Potamoganos* Sandw. (Bignoniaceae) belong to tribe Bignonieae, which is composed almost exclusively of lianas and which has been demonstrated recently to be monophyletic using *rbc*L and *ndh*F gene sequences (Spangler & Olmstead, 1999). *Roentgenia* is a ditypic genus of primarily lowland lianas with white to lavender, campanulate-funnelform, "*Cydista*-type" corollas (Fig. 1), stems with eight phloem arms, bi-trifid tendrils, 3(–4)-colpate pollen with reticulate exine, 2-seriate ovule organization, nectariferous disk lacking, linear-oblong fruit, and winged seeds (Gentry, 1977, 1978, 1997; Gentry & Tomb, 1979; Tomb & Gentry, unpublished). *Roentgenia* is closely related to such genera (Table 1) as *Cydista* Miers (6 species), *Clytostoma* Miers ex Bureau (12 species), *Potamoganos* (1 species), and *Phryganocydia* Mart. ex Bureau (4 species) (Gentry, 1977, 1997; Gentry & Tomb, 1979; Tomb & Gentry, unpublished; Hauk, 1997).

Potamoganos is a monotypic genus of primarily lowland lianas with lavender to magenta, campanulate-funnelform corollas (Fig. 2). Among genera of tribe Bignonieae with "*Cydista*-type" flowers, it is distinguished by a combination of characters: stems with four phloem arms, trifid tendrils, 3-colpate pollen with reticulate exine, 4-seriate ovule organization, and a nectariferous disk (Gentry, 1977, 1978; Gentry & Tomb, 1979; Tomb & Gentry, unpublished; Hauk, 1997). *Potamoganos* has a "*Cydista*-type" corolla (Gentry, 1978) and is closely related to several larger genera (Table 1) such as *Cydista*, *Clytostoma*, *Roentgenia*, and *Phryganocydia* (Gentry & Tomb, 1979; Hauk, 1997).

The late Alwyn H. Gentry treated *Roentgenia* and/or *Potamoganos* in several regional floras (Gentry, 1977, 1978, 1983, 1993, 1997, in press), but his monographic work did not encompass *Roentgenia*, *Potamoganos*, or other genera of the tribe Bignonieae. This paper utilizes the vast amount of information chronicled by Gentry in his studies of Bignoniaceae and attempts to compile these sources on *Roentgenia* and *Potamoganos* into a single treatment. The database established by Gentry's investigations has allowed production of detailed maps of geographic distribution (Figs. 3, 4). Distribution data presented here provide an important foundation for future investigations of the

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Table 1. Morphological/anatomical characters and character states for *Roentgenia* and *Potamoganos* and three genera putatively closely related (after Gentry, 1977, 1997; Gentry & Tomb, 1979; Tomb & Gentry, unpublished).

	Tendrils	Phloem arms	Nectar disk	Corolla pubescence	Ovule organization	Fruit surface	Seed	Pollen aperture	Pollen exine
Roentgenia	bi-trifid	8	absent	lepidote	2-seriate	non-echinate	bialate	3(–4)-colpate	reticulate
Cydista	simple	8	absent	lepidote	2(–4)-seriate	non-echinate	bialate	inaperturate/pericolpate	reticulate
Clytostoma	simple	8	absent	lepidote	2(–4)-seriate	echinate	corky	inaperturate	reticulate
Phryganocydia	simple	8	absent	lepidote	2-seriate	non-echinate	corky	inaperturate	reticulate
Potamoganos	trifid	4	present	glabrous/lepidote	4-seriate	?	?	3-colpate	reticulate

taxonomy and systematics of *Roentgenia* and *Potamoganos*.

History and Systematics

In 1916, Urban described *Roentgenia* and transferred *Cydista bracteomana* K. Schum. ex Sprague into the genus as its sole species. Urban considered *Roentgenia* distinct from *Cydista* based on the trifid tendrils and plurisulcate pollen of the former (Sprague & Sandwith, 1932). Sprague and Sandwith transferred *Arrabidaea sordida* Bureau & K. Schum. to *Roentgenia* in 1932, after examining additional collections more complete than the holotype. Macbride (1961) questioned the use of pollen characters alone as generic markers, and noted that other characters, for example simple vs. trifid tendrils, that separate *Roentgenia* from *Cydista* are not stable in Bignoniaceae. Gentry (1974a) acknowledged that the primary features distinguishing the two genera, tendril and pollen, might not be sufficient to retain *Cydista* and *Roentgenia* as distinct. Gentry (1978: 262) wrote that *Roentgenia* is "barely separable from *Cydista*," although he treated them as distinct in his floristic works (Gentry, 1977, 1978, 1983, 1993, 1997).

Gentry (1974a: 880) reported that the distinction between the trifid tendril of *Roentgenia* and the simple tendrils of *Cydista* "breaks down" in a collection of *R. bracteomana* (*Seibert 2146*; not examined by this author). However, the putative presence of anomalous tendrils in a single specimen does not provide a strong argument for treating *Roentgenia* and *Cydista* as congeneric. From a cladistic perspective, the perisyncolpate pollen, linear to linear-trisect bracts and bracteoles, and trifid tendrils of *R. bracteomana* and *R. sordida* provide synapomorphies that indicate they are sister species. Because there is no evidence, either morphological or molecular, that provides a sound basis for combining the two genera, this treatment retains *Roentgenia* as distinct from *Cydista*. Whether *Roentgenia* arose from within a paraphyletic *Cydista* (or conversely), or as sister to *Cydista* or another closely related genus, is not clear at this time. Only future, detailed morphological and/or molecular investigations will be able to address rigorously the monophyly of *Roentgenia* and *Cydista*, and the relationship of these two genera to the presumably closely related *Clytostoma*, *Phryganocydia*, and *Potamoganos*.

G. F. W. Meyer described *Bignonia microcalyx* in 1818, and Sandwith (1937) transferred it to *Potamoganos*, noting its affinities to *Cydista* and *Roentgenia*. However, Sandwith (1937) asserted

that the presence of a nectariferous disk distinguished the taxon from both *Cydista* and *Roentgenia*.

The cupular calyx and "*Cydista*-type" flower of *Potamoganos* (Fig. 2A) led Gentry (1978) to conclude that *Potamoganos* is allied to *Cydista* and *Roentgenia*. However, *Potamoganos* differs from these genera in having a well-developed nectariferous disk (Fig. 2C), and lacking glandular fields [presumably on the calyx] (Gentry, 1978). Three other genera, *Clytostoma*, *Roentgenia*, and *Phryganocydia*, possess the "*Cydista*-type" corolla but lack a nectariferous disk (Gentry, 1978). However, *Phryganocydia* has a long, spathaceous calyx, not the cupular calyx characteristic of *Roentgenia* and *Cydista*.

The 3-colpate pollen of *Potamoganos* differs from the inaperturate pollen of *Clytostoma*, *Phryganocydia*, and most species of *Cydista* (Gentry & Tomb, 1979). *Roentgenia* is the only other genus with *Cydista*-type corollas that has aperturate pollen (i.e., colpate), although perisyncolpate pollen is known in four of the six species of *Cydista* (*C. decora*, *C. diversifolia*, *C. heterophylla*, and *C. aequinoctialis*; Gentry & Tomb, 1979). The surface of *Roentgenia* pollen is verrucate to scabrate, and unlike the medium-reticulate surface found in *Potamoganos* pollen (Gentry & Tomb, 1979). *Phryganocydia* has finely scabrate pollen that differs from the medium-reticulate type of *Potamoganos*, *Clytostoma*, and most species of *Cydista* (Gentry & Tomb, 1979).

The chromosome numbers of *Roentgenia* and *Potamoganos* are not known. However, Goldblatt and Gentry (1979) reported chromosome numbers of $2n = 40$ in 21 of the 23 genera of tribe Bignonieae they surveyed, including *Cydista* and *Clytostoma*, and it is likely that *Roentgenia* and *Potamoganos* have a similar chromosome number.

Distribution

Collections of *R. bracteomana* extend from southern Colombia to northern Bolivia, with some extension into north-central and western Brazil (Fig. 3). Collections of *R. sordida* occur from eastern Venezuela, Guyana, Suriname, French Guiana, and northern Brazil, with a single collection from Amazonas, Brazil (Fig. 3).

Collections of *Potamoganos microcalyx* occur from south-central Venezuela, Guyana, Suriname, and the northernmost portions of Brazil (Fig. 4). In western Suriname, *P. microcalyx* grows in lowland forests (0–60 m) and is present in many moist forests and riverine habitats (pers. obs.).

Phenology

Roentgenia and *Potamoganos* are closely related to a group of genera (*Cydista*, *Clytostoma*, and *Phryganocydia*) that Gentry and Tomb (1979) suggested constitute a natural group because they share similar pollen morphology, a tendency toward "multiple bang" flowering phenology, and the absence of a nectariferous disk. "Multiple bang" species have numerous, synchronized, short flowering periods (ca. 3 days) that may occur at any time of the year (Gentry, 1974b). The absence of a nectariferous disk (and presumably nectar), coupled with conspicuous visual and olfactory attractants, indicates that pollinator deceit may be the ultimate pollination strategy (Gentry, 1974b). The short, repeated floral bursts may serve to lure novice pollinators that effect pollination through visits to only a few flowers, after which they seek a more ample nectar source (Gentry, 1974b). Visits by potential pollinators are infrequent, presumably because pollinators learn quickly that the flowers offer no nectar reward (Gentry, 1974b).

Fertile collections of *Roentgenia bracteomana* and *R. sordida* are known from throughout the year and are consistent with a "multiple bang" pollination syndrome. However, little is known about the pollinators of these two species, and more detailed examinations of flower production are necessary to document reproductive mode.

The reproductive biology of *Potamoganos* is not documented, but the close relationship of *Potamoganos* to "multiple bang" genera suggests a predisposition to a "multiple bang" strategy. However, the nectariferous disk in *Potamoganos microcalyx* (Fig. 2C) could signal a departure from the "multiple bang" strategy. The flowering specimens examined for this treatment document that *P. microcalyx* flowers in February, April, May, and October. Thus, the phenology data available are consistent with a "multiple bang" syndrome for *P. microcalyx*.

Materials and Methods

Gentry compiled a private database of label information from herbarium specimens he collected and from specimens at other herbaria that he examined personally. Gentry's database has been incorporated into the Missouri Botanical Garden database-management system, TROPICOS, which also contains label information for all *Roentgenia* and *Potamoganos* specimens housed at MO. All types were assumed to have been seen by Gentry unless otherwise noted. Gentry did not always designate types as "holotype," "isotype," or "syntype," and the designations presented here are based upon

inferences drawn from Gentry's work and the original literature; these type designations were not based on personal verification of specimens at the various herbaria. An index to numbered exsiccatae is provided in Appendix 1.

Data used for mapping and phenology were downloaded from TROPICOS, <http://mobot.mobot.org/W3T/Search/vast.html>. For records with no latitude/longitude coordinates in TROPICOS, approximate coordinates were obtained from gazetteers produced by the U.S. Board on Geographic Names, Office of Geography, Dept. of the Interior. Distribution maps were produced using the computer program VERSAMAP 1.51 (C. H. Culberson, Newark, DE, 1991–1995).

Taxonomic Treatment

Roentgenia Urb., Ber. Deutsch. Bot. Ges. 34: 747. 1916. TYPE: *Roentgenia bracteomana* (K. Schum. ex Sprague) Urb.

Lianas; stems terete to subtetragonal with 8 phloem arms in cross section; branchlets terete to subtetragonal with interpetiolar glandular fields lacking and transverse interpetiolar ridges present or absent, the younger branchlets striate, glabrate to lepidote; pseudostipules caducous to somewhat persistent, foliaceous, chordate-orbicular, glandular, glabrate to lepidote. *Leaves* opposite, estipulate, petiolate, bifoliolate with the terminal segment often modified into a trifid tendril; petioles and petiolules terete to slightly flattened, glabrate to puberulent or sparsely lepidote; ultimate segments entire, chartaceous, marginally plane; venation brochidodromous; midrib prominent with secondary veins pinnate; axils of secondary veins lacking glandular fields. *Inflorescences* elongate, axillary or terminal racemes, branched or unbranched, several- to many-flowered; rachis and peduncles terete to subtetragonal, puberulent to lepidote, and bracteate, the bracts linear to linear-trisect, each segment linear, persistent to caducous, glandular or eglandular, puberulent to caducous; pedicels terete, puberulent to lepidote; bracteoles linear to linear-trisect, persistent to caducous, glandular or eglandular, puberulent to lepidote. *Flowers* ovoid in bud; calyx campanulate-funnelform, glandular or eglandular, costate or ecostate, glabrate to lepidote or puberulent, the calyx margin usually split, apically truncate except for five minute teeth; corolla zygomorphic, tubular-funnelform, white to magenta with purple markings and the tube yellowish, glabrate to lepidote externally, pilose pubescence at the base of the filaments; corolla lobes 5 (2 upper and 3 lower), short-orbicular, the inner surface glabrate to lepidote, the outer surface lepidote; stamens 5, fertile stamens didynamous with the fifth stamen modified into a staminode, all adnate to the corolla; fertile anthers with two spreading thecae, included, glabrate; disk absent; ovary cylindrical, lepidote, the ovules biseriate in each locule; stigma included, bipartite, the divisions laterally flattened. *Fruit* a septicidal capsule dehiscing parallel to the septum, linear-oblong, the valves compressed and not conspicuously thickened, the margins not serially constricted, drying brown, the midline not evident, the surface rough, plane and glabrescent or sparsely lepidote to puberulous; many-seeded; seeds flattened, oblong, bialate, the body distinct and bipartite.

Key to Flowering Specimens

1. Bracts 10–15 mm long; bracteoles 5–10 mm long, extending beyond the base of the calyx ..... *R. bracteomana*
1′. Bracts 1–5 mm long; bracteoles 1–3 mm long, not extending to the base of the calyx ..... *R. sordida*

1. Roentgenia bracteomana (K. Schum. ex Sprague) Urb., Ber. Deutsch. Bot. Ges. 34: 747. 1916. *Cydista bracteomana* K. Schum. ex Sprague, Verh. Bot. Vereins Prov. Brandenburg 1908: 121. 1909. TYPE: Brazil. Amazonas: Victoria, Rio Jura, May 1901, *Ule 5497* (holotype, B not seen; isotypes, HB not seen, L not seen, MG not seen). Figure 1.

Lianas; branchlets drying light brown to gray, terete to subtetragonal, with interpetiolar transverse ridge evident but inconspicuous, the lenticels not evident or inconspicuous; pseudostipules caducous, 8–11 × 15–18 mm. *Leaves* 10–37 cm long; petioles 0.5–6.0 cm, terete to slightly flattened, glabrate to sparsely lepidote; petiolules 1.0–5.0, terete, glabrate to lepidote; ultimate segments (7)10.5–28 × 4.5 × 14 cm elliptic to ovate-elliptic, densely lepidote when young, in older leaves glabrescent to sparsely and inconspicuously lepidote, especially along the basal portions of the veins beneath, apically acute, basally acute to obtuse, with 5–6 principal vein pairs. *Inflorescences* axillary racemes to 30 cm long, unbranched, several- to many-flowered; rachis and peduncles terete to subtetragonal, lepidote, and bracteate, the bracts trisect, each segment linear, 10–15 × 2–4 mm, persistent, glandular, lepidote; pedicels 5–7 mm long, lepidote; bracteoles 5–10 × 1–3 mm, persistent, glandular or eglandular, lepidote, extending beyond the base of the calyx. *Flowers:* calyx 5–10 × 4–7 mm, glandular or eglandular, costate, the outer calyx surface sparsely lepidote, the inner surface glabrate, the margin intact or split 1/4–1/2 the length of the tube, the valves apically

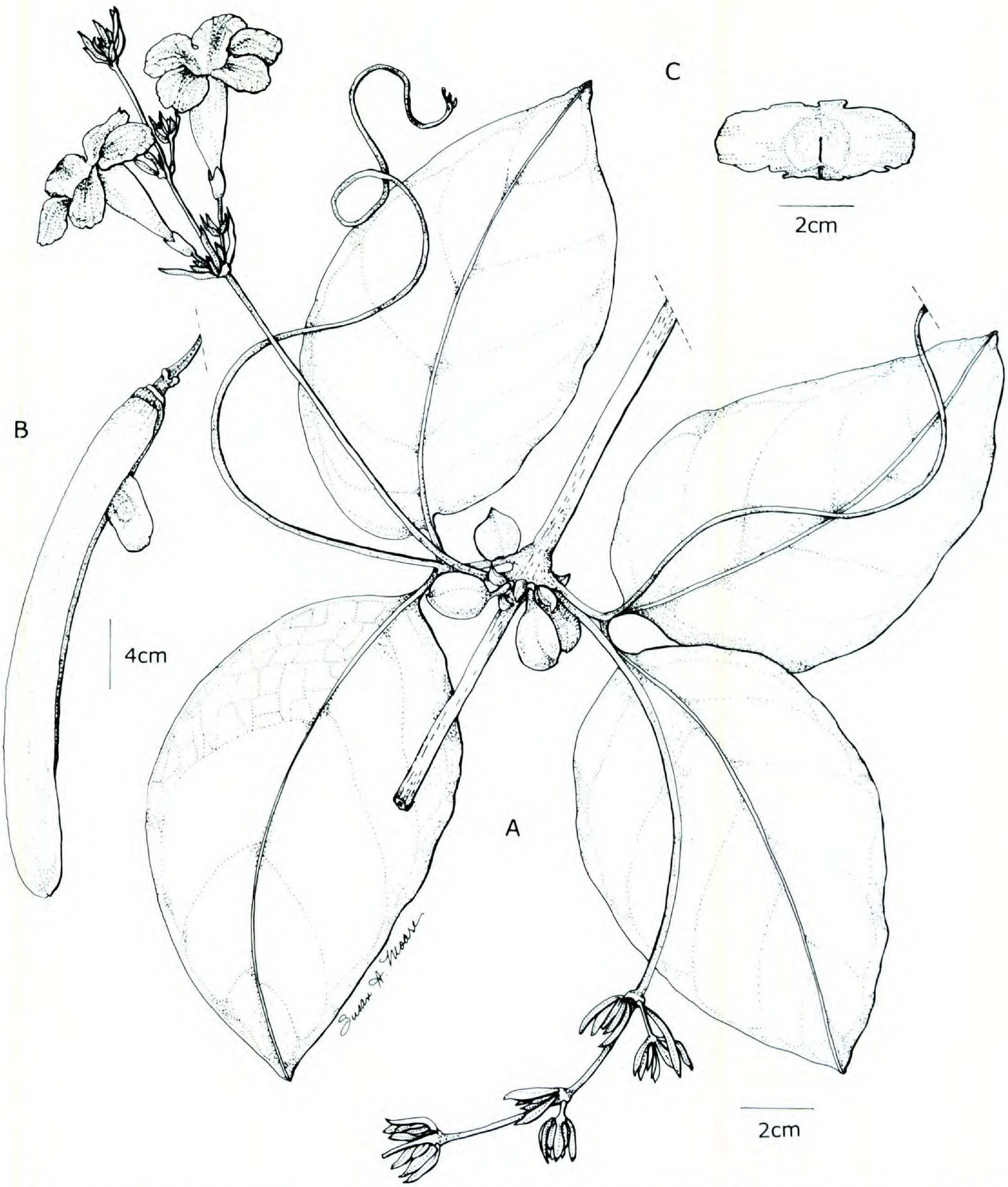

Figure 1. *Roentgenia bracteomana.*—A. Leaves with inflorescence, after *R. Burnham 1563.*—B. Fruit with seed, after *Plowman & Schunke V. 7503.*—C. Seed, after *Plowman & Schunke V. 7503.*

acute to truncate except for 5 minute teeth; corolla exserted 30–35 mm beyond the calyx lip (35–40 mm total length), 2–3 mm wide at the calyx lip; corolla lobes 15 × 10 mm; fertile stamens 9 or 16 mm long, inserted ca. 10 mm beyond the corolla tube base, the staminode 2 mm long, inserted 2 mm proximal to the stamens; ovary 2–3 mm long; style ca. 30 mm long. *Capsule* 27–60 × 2.0–2.5 mm, glabrescent; seeds flattened, 2.0–2.3 × 5.5–6.2 cm, 1–2 mm thick, oblong, bialate, the body ovoid and bipartite. *Figure:* Gentry (1993, fig. 71–6).

Distribution, elevation, and habitat. Known from southern Colombia to northern Bolivia with a few collections from western and north-central Brazil (Fig. 3). Collections are reported from 150 to

870 m, in premontane wet and tropical wet forests, on terra firme forests or in riverine habitats.

Phenology. Flowering collections of *Roentgenia bracteomana* are from: January (10), February (4), March (4), April (1), May (3), July (1), August (3), September (1), October (7), November (1), and December (1). Fruiting collections are from: February (1), March (1), April (1), May (3), June (4), July (3), September (2), and October (3).

Representative specimens. COLOMBIA. **Caquetá:** 41 km N of Florencia, 1060 m, *Gentry 9169* (MO). **Putumayo:** Selva higrofila del Río Putumayo en las márgenes del afluente izquierda La Concepción, 225 m, *Cuatrecasas 10834* (COL). ECUADOR. **Napo:** Armenia Vieja at Río Napo, 12 km SW of Coca, *Lugo 2703* (GB, MO). **Morona-Santiago:** Taisha, Río Guaguaine, 500 m, *Cazalet & Pennington 7558* (K, NY, US). **Pastaza:** Río Bobonaza, Quilloallpa below Montalvo, 02°10′S, 76°53′W, 300 m, *Øllgaard et al. 34586* (AAU, MO). **Santiago-Zamora:** banks of Río Guaguaymi, 500 m, *Cazalet & Pennington 7558* (K, NY, US). **Sucumbios:** without exact locality, 240 m, 00°08′S, 76°22′W, *Carlos E. Cerón & Judith Ayala 9469* (MO). **Zamora-Chinchipe:** without exact locality, 930 m, 04°18′S, 78°43′W, *W. Palacios, I. Vargas & E. Freire 8717* (MO). PERU. **Amazonas:** Armango, 300 m, *Woytkowski 5637* (MO). **Huánuco:** Codo de Pozuzo, alluvial fan floodplain of Río Pozuzo, 10°15′S, 74°55′W, 300 m, *Foster 9388* (MO). **Loreto:** Alto Amazonas, Río Pastaza, Lago Rimachi, 04°20′S, 76°35′W, 200 m, *Díaz S. & Ruiz 924* (AAU, MO). **Madre de Dios:** 39 km SW of Pto. Maldonado, Laguna Cocacocha, 12°50′S, 69°20′W, *Smith & Shuhler 400* (MO). **Puno:** ridge between Río Candamo and Río Guacamayo, 13°30′S, 69°50′W, 400–600 m, *Gentry et al. 76941* (MO). **San Martín:** Fundo San Pablo, Mariscal Caceres, Tocache Nuevo, 450 m, *Schunke V. 11788* (F). **Ucayali:** vicinity of LSU base camp, Quebrada Shesha, ca. 65 km NE of Pucallpa, 08°02′S, 73°55′W, 250 m, *Gentry & Díaz 58505* (MO). BOLIVIA. **Beni:** Km 34 carretera Yucumo–Rurrenabaque, Colegio Técnico Agropecuario Río Colorado, 14°50′S, 67°05′W, 230 m, *Smith et al. 14115* (MO). **La Paz:** Abel Iturralde Province, Alto Madidi across from mouth of Río Enlatagua, 13°35′S, 68°46′W, 280 m, *Gentry & Estensoro 70344* (MO). BRAZIL. **Amazonas:** Rio Jurua, *Ule, E. 5497* (HB, L, MG). **Maranhão:** Rio Xingu, 04°49′S, 52°31′W, *Balée 1958* (NY).

Flowering material of *Roentgenia bracteomana* is distinctive because of the prominent bracts and bracteoles; no species of *Cydista* or *Clytostoma* have similar-sized bracts or bracteoles. The lack of conspicuous bracts and bracteoles in *R. sordida*, coupled with a largely allopatric distribution, makes confusion of the two species unlikely. Vegetatively, trifid tendrils distinguish *Roentgenia* from *Cydista* and *Clytostoma*, but sterile material lacking tendrils may be easily mistaken for species of these closely related genera.

2. Roentgenia sordida (Bureau & K. Schum.) Sprague & Sandw., Bull. Misc. Inform. Kew 1932: 91–92. 1932. *Arrabidaea sordida* Bureau & K. Schum., in Mart., Fl. Bras. 8 pt. 2, fasc. 118: 30–31. 1896. TYPE: Guyana. Upper Rupunini River, *Schomburgk 1296* (holotype, B not seen, presumed destroyed).

Arrabidaea pullei Sprague, Bull. Herb. Boissier, 2 ser. 6(5): 373–374. TYPE: Suriname. Sipaliwini: upper Saramacca River, *Pulle 170, 495* (holotype, U not seen).

Lianas; branchlets drying tan to gray, terete, glabrate to puberulent or lepidote, with transverse interpetiolar ridge evident but inconspicuous, the lenticels not evident; pseudostipules ± persistent, foliaceous, 5–8 × 6–7 mm. *Leaves* 11–27 cm long; petioles 1.2–5.0 cm, terete, puberulent; petiolules 0.6–3.0 cm, terete, puberulent; ultimate segments 8–22 × 3–15 cm, elliptic to ovate, glabrate to lepidote (especially on young material) or puberulent, especially on basal portions of the main veins, apically acute to obtuse, basally obtuse to rounded or inequilateral, with 5 to 6 principal vein pairs. *Inflorescences* axillary or terminal racemes to 20 cm long, unbranched, many-flowered; rachis and peduncles terete to subtetragonal, puberulent to lepidote, bracteate, bracts 1–5 × 0.5–1 mm, caducous, eglandular, puberulent to lepidote; pedicels 3–6 mm long, puberulent to lepidote; bracteoles linear (to linear-trisect), 1–3 × 0.5–1.0 mm, caducous, eglandular, puberulent to lepidote, not extending to the base of the calyx. *Flowers*: calyx 4–7 × 3–6 mm, glandular, ecostate, the outer calyx surface puberulent to lepidote, the inner surface glabrate, the margin intact or split 1/8–1/2 the length of the calyx, the valves apically obtuse with 5 minute teeth; corolla exserted (25)32–42 mm beyond the calyx lip ((29)36–49 mm total length), 1.5–3 mm wide at the calyx lip; corolla lobes 12 × 12 mm; fertile stamens 8 or 16 mm long, inserted 9 mm beyond the corolla tube base, the staminode 2 mm long, inserted 1–2 mm proximal to the insertion of the fertile stamens; ovary 4 mm long; style ca. 25 mm long. *Capsule* 27–34 × 2 mm, sparsely lepidote to puberulous; seeds not observed. *Figures:* Gentry (1983, fig. 39; 1997, fig. 409).

Distribution, elevation, and habitat. Known from eastern Venezuela, Guyana, Suriname, French Guiana, and northern Brazil, with a few, scattered collections from western Brazil (Fig. 3). Collections are reported from 350 to 2000 m, in non-inundated moist forests, swampy mature forests, or white sand areas.

Phenology. Flowering collections of *Roentgenia sordida* are from: January (5), March (1), April (1), May (3), July (1), September (1), October (6), November (7), and December (4). The sole fruiting specimen examined was collected in March.

Representative specimens. BRAZIL. **Amapa:** Mpio. de Calcoene, 02°49′N, 51°23′W, *S. Mori & R. Souza 17263* (MO). **Amazonas:** São Paulo de Olivença, basin creek of Belém, *Krukoff 8623* (BM, F, MO, NY, U). **Maranhão:** Monção, P.I. Guaja, Rio Turiaçú, 03°07′S, 46°0′W, *Balée 3517* (MO). **Pará:** Campus of IPEAN, Belém, *Gentry 13077* (MO). FRENCH GUIANA. Approuague, en amont de Crique Tortue, *Oldeman 2303* (CAY). **Cayenne:** Montagne de Kaw, Piste Roura/Kaw, 04°33′N, 52°09′W, 350 m, *Feuillet 2926* (MO). GUYANA. **East Berbice:** margins of Berbice River, S of New Dageraad, 06°00′N, 57°43′W, *Maas et al. 5573* (U). **Mazaruni:** Upper Mazaruni River Basin, Akapai, 470 m, *Tillett & Tillett 45685* (MO). SURINAME. **Nickerie:** right bank of Corantijn River, N of Kaboerie Cr., *Heyde 449* (MO). **Para:** Jodensavanne-Mapanekreek, Suriname River, *Kramer & Hekking 7450* (U). **Saramacca:** Fluv. Saramacca, Mt. Janbasigado, *Pulle 170* (U). **Wanika:** between Tawajari-Weg and de Crane-Weg, W of Lelydorp in old sec. wood on white sand, *Heyde 596* (MO). VENEZUELA. **Bolívar:** Río Paragua, hasta 12 vueltas arriba de la boca del Río Tonoro, 06°03′N, 63°47′W, 175 m, *Stergios 10320* (MO). **Delta Amacuro:** E of Río Grande, E of El Palmar, *Gentry & Berry 14938* (MO). **Mérida:** Marcano Berti, *Luis 199* (MO, VEN).

When intact tendrils are not present on a specimen, the short bracts and bracteoles of *Roentgenia sordida* make it particularly difficult to distinguish from the sympatric *Cydista aequinoctialis* (L.) Miers, although the latter can usually be distinguished by dark glandular fields (when dried) in the axils of the secondary veins beneath; these glandular fields were not observed in *Roentgenia.* Gentry (1978: 279) suggested that the racemose-paniculate inflorescence and overall leaf appearance of *Cydista lilacina* A. H. Gentry "links" the genera *Cydista, Roentgenia,* and *Clytostoma.* However, *C. lilacina* is distinct from other *Cydista* species in its curved bud apices and 4-seriate ovules (Hauk, 1997), and these two features serve to distinguish *C. lilacina* from *R. sordida.* The "bromeliad-like," persistent pseudostipules and echinate fruit of *Clytostoma* are distinct from the foliaceous, caducous pseudostipules and rough (but plane) fruit of *R. sordida. Potamoganos microcalyx* (G. Mey.) Sandw. is partially sympatric with *R. sordida* and has trifid tendrils, but *P. microcalyx* differs from *R. sordida* in having a nectariferous disk.

Potamoganos Sandw., Recueil Trav. Bot. Néerl. 34: 220–221. 1937. TYPE: *Potamoganos microcalyx* (G. Mey.) Sandw.

Lianas; stems woody with 4 phloem arms in cross section, branchlets terete to subtetragonal with interpetiolar glandular fields present and distal to the node, the transverse interpetiolar ridges not evident, the younger branchlets striate and glabrate to lepidote; pseudostipules caducous, subfoliaceous, triangular, eglandular, lepidote. *Leaves* opposite, estipulate, petiolate, 2- or 3-foliolate with the terminal leaflet often modified into a trifid tendril; petioles terete, glabrate; petiolules terete to sulcate, glabrate to lepidote; leaflets entire, marginally plane; axils of secondary veins lacking glandular fields. *Inflorescences* elongate, axillary racemes, unbranched, several-flowered; rachis and peduncles flattened to nearly terete, glabrate to lepidote, bracteate, the bracts minute, caducous, lacking circular glandular fields, glandular-lepidote; pedicels flattened, glabrate to lepidote; bracteoles minute, caducous, eglandular, glandular-lepidote. *Flowers* ovoid in bud; calyx cupular-campanulate, eglandular, lepidote, the calyx margin intact, the apex truncate except for five minute teeth; corolla zygomorphic, campanulate-funnelform, lavender to magenta, glabrate to sparsely lepidote, with an inner ring of pubescence proximal to the insertion of the stamens; corolla lobes 5 (2 upper and 3 lower), short-orbicular, the inner surface glabrate, the outer surface glabrate to lepidote; stamens 5, fertile stamens didynamous with the fifth stamen modified into a staminode, all adnate to the corolla; fertile anthers with two spreading thecae, included, glabrous; nectariferous disk present; ovary cylindrical, densely lepidote, the ovules 4-seriate in each locule; stigma included, bipartite, the divisions laterally flattened. *Fruit* not seen.

1. **Potamoganos microcalyx** (G. Mey.) Sandw., Recueil Trav. Bot. Néerl. 34: 220–221. 1937. *Bignonia microcalyx* G. Mey., Prim. Fl. Esseq. 211. 1818. TYPE: Guyana, *Meyer s.n.* (holotype, GOET not seen), not seen by Gentry. Figure 2.

Bignonia microcalyx var. *acuminata* Miq., in Flora 25(2): 427. 1842. TYPE: Suriname, (holotype?, U not seen).

Anemopaegma cupulatum Bureau & K. Schum., in Mart., Fl. Bras. 8 pt. 2, fasc. 121: 146. 1897. TYPE: Suriname, without exact locality, *Wullschlaegel 1034* (BR not seen).

Lianas; branchlets drying brown to red-brown, striate, glabrate, lenticels not evident; pseudostipules triangular, 1 × 1 mm, eglandular, lepidote. *Leaves* 15–25 cm long, once-pinnate, bifoliolate with a terminal leaflet often modified into a trifid tendril; petioles 3.5–11.0 cm long, glabrate to puberulent or lepidote; petiolules 0.5–3.5 cm long, glabrate to lep-

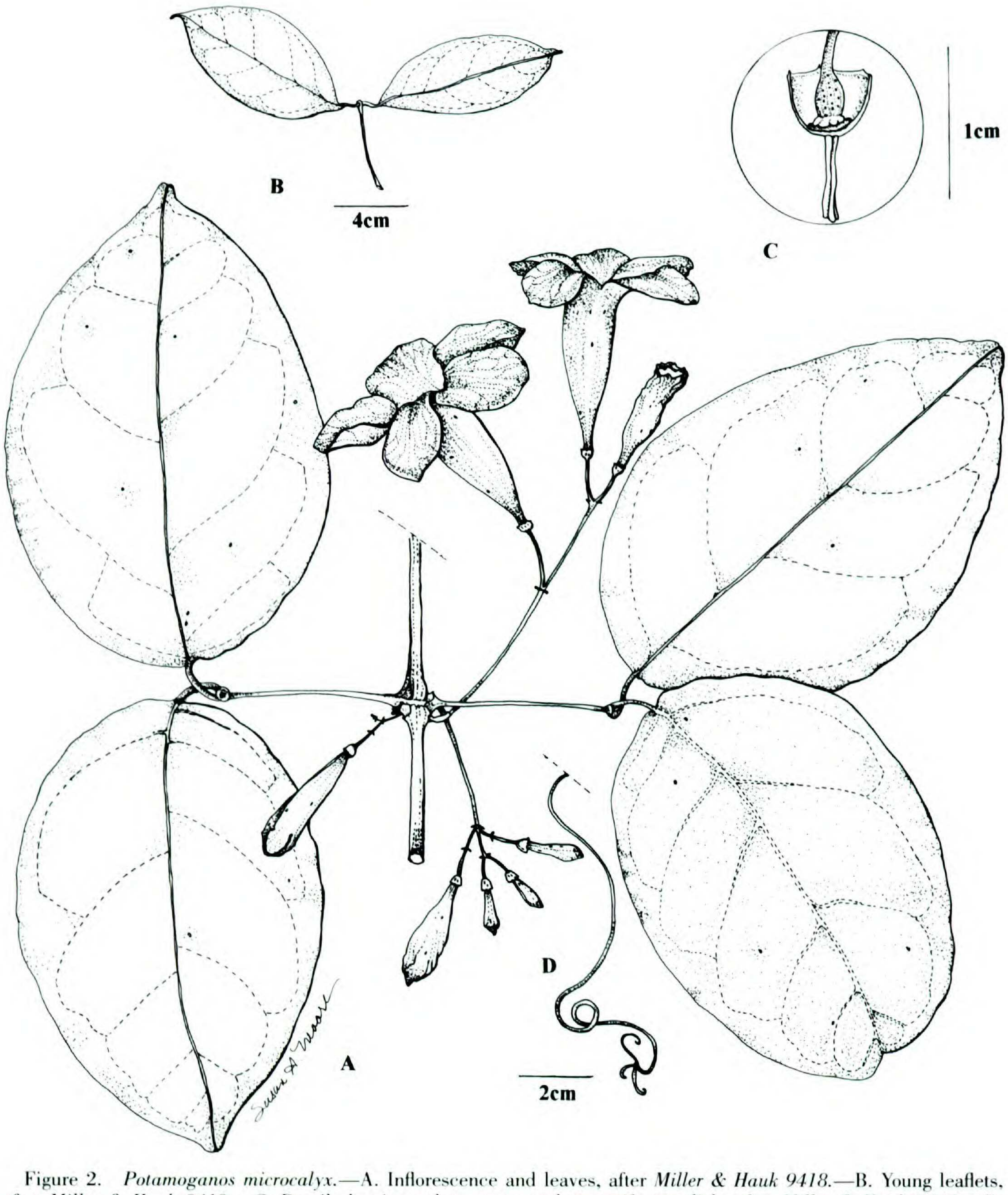

Figure 2. *Potamoganos microcalyx.*—A. Inflorescence and leaves, after *Miller & Hauk 9418.*—B. Young leaflets, after *Miller & Hauk 9418.*—C. Detail showing calyx, ovary, and nectariferous disk, after *Miller & Hauk 9418.*—D. Tendril, after *Miller & Hauk 9418.*

idote; leaflets 6.5–13 × 4.0–8.5 cm, elliptic to suborbicular, plane, chartaceous, glabrate with a few minute glands scattered over the surface, apically acute to obtuse, basally broadly acute to rounded, with 4 to 5 principal vein pairs, marginally plane. *Inflorescences* to 20 cm long; bracts linear, 1.0 × 0.5 mm; bracteoles linear, 0.5–1.0 × 0.5 mm; flowers ovoid in bud; calyx 3–5 × 5–6 mm, glabrate to sparsely lepidote; corolla exserted 35–55 mm beyond the level of the calyx lip (40–60 mm total length), 2.5–3.0 mm wide at the calyx lip, the corolla tube lepidote inwardly and glabrate outwardly; corolla lobes 18 × 15 mm; fertile stamens 12 or 18 mm long, inserted ca. 5 mm beyond the corolla tube base, the staminode 3 mm long, inserted 3 mm beyond the corolla tube base; disk 1 mm tall; ovary 2–3 mm long; style 15–20 mm long. *Fruit* not seen. *Figures:* Gentry (1983, fig. 37; 1997, fig. 407).

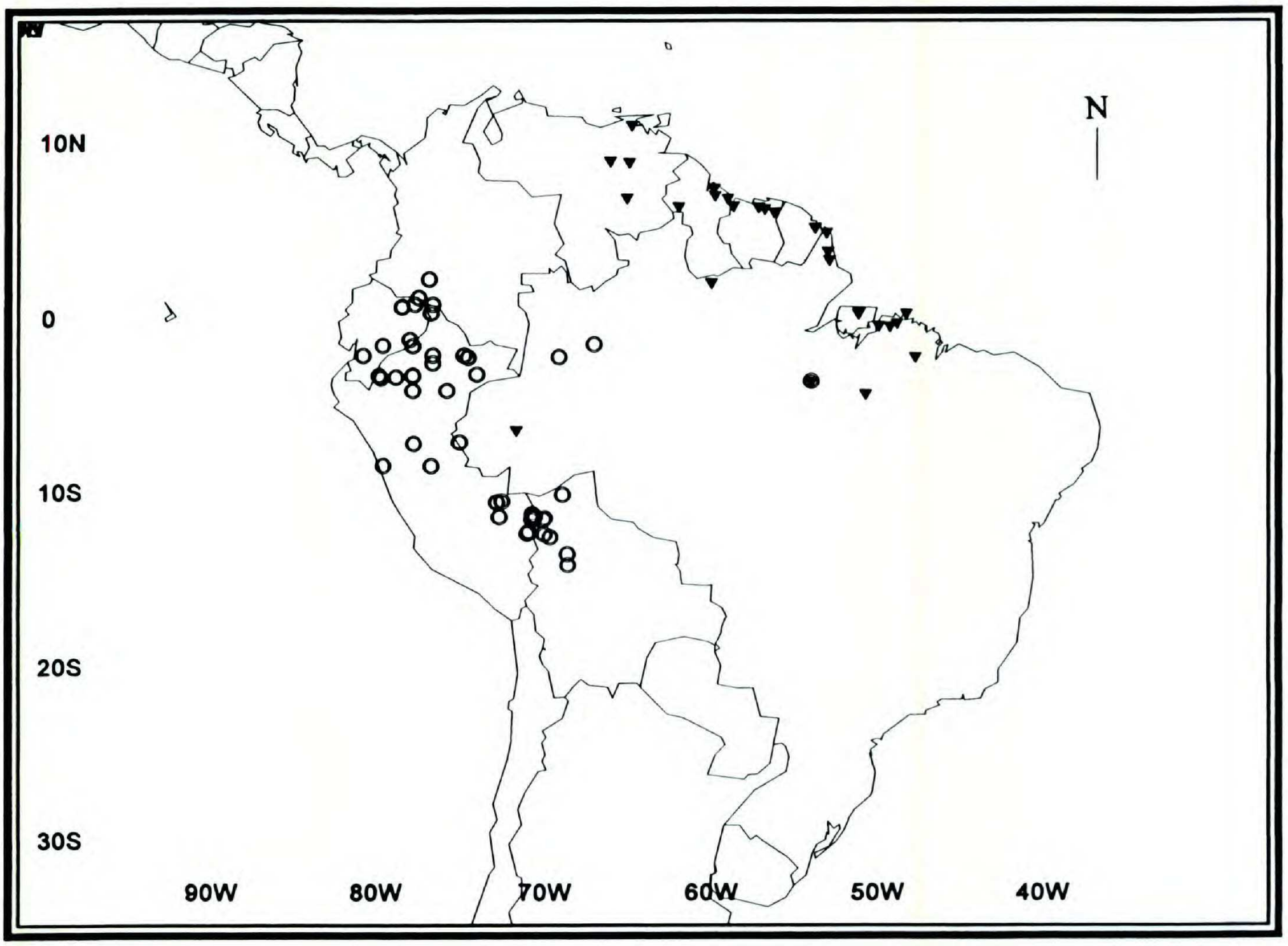

Figure 3. Geographic distribution of collections of *Roentgenia bracteomana* (circles) and *R. sordida* (triangles) in South America.

Distribution, elevation, and habitat. Known from south-central Venezuela, Guyana, Suriname, and portions of northern Brazil (Fig. 4). Collections are reported from 0 to 300 m in mixed lowland forest, often on lateritic soils.

Phenology. Four flowering collections were examined: February (1), April (1), May (1), and October (1). No fruiting collections were seen or have been documented.

Additional specimens. BRAZIL. **Amapa:** without exact locality, 02°03′N, 50°48′W, *Ducke 1973* (MG). **Amazonas:** Boa Vista Road, 64 km N of Manaus, 02°40′S, 60°08′W, *Lowe 4190* (MO). GUYANA. Vicinity of Kartabo Station, junction of Mazaruni and Cuyuni Rivers, 06°30′N, 58°40′W, *Graham 307* (CM). **Rupununi:** foothills of NW Kanuku Mts., near Moco-Moco village, 03°20′N, 59°35′W, 100 m, *Maas & Westra 3906* (MO). **Essequibo:** Malali, Demerara River, 05°50′N, 58°15′W, *de la Cruz 2726* (CM, US); Arawau Trail, 23 mi. from Linden, 06°00′N, 58°15′W, 20 m, *Grewal 16* (U). SURINAME. **Voltzberg:** without exact locality, *Pulle 307* (U). **Saramacca:** Coppename River, 3 km below base camp, 05°30′N, 55°50′W, *Florschutz & Maas 2734* (U). **Sipaliwini:** Mamadam, 04°40′N, 55°40′W, *Florschutz & Florschutz 1155* (U); Montibus Bakhuisinter fluv. Kabalebo & Coppename Sinistera, Kabalebo River 1–5 km below airstrip, 03°50′N, 56°50′W, *Florschutz & Maas 2340* (U); area of Kabalebo Dam project, 04°10′N, 57°10′W, *Heyde & Lindeman 192* (MO); vicinity of Blanche Marie falls on the Nickerie River, 04°45′N, 56°52′W, 60 m, *Miller & Hauk 9418* (BBS, MO); Fluv. Saramacca, prope Mt. Janbasigado, 04°20′N, 55°30′W, *Pulle 415* (MO, U). VENEZUELA. **Amazonas:** 23 km NE of Puerto Ayacucho, 05°51′N, 67°25′W, 90 m, *Davidse & Huber 15362* (MO); Río Orinoco below San Fernando de Atabapo, Cano Morocoto, 1 hour below San Fernando, 04°10′N, 67°42′W, *Gentry et al. 10947* (MO); Río Cuao, Río Orinoco, 04°55′N, 67°40′W, 125 m, *Maguire & Politi 28436* (NY, US); Cerro Huachamacari, Río Cunucunuma, 03°48′N, 65°46′W, 400 m, *Maguire et al. 29973* (VEN).

The shape and color of the *Cydista*-type corollas of *P. microcalyx* are easily confused with those of the sympatric *Cydista aequinoctialis* (L.) Miers and *C. lilacina* A. H. Gentry. However, the inflorescence axes of *P. microcalyx* are longer and more flattened than either *Cydista* species, and the calyx is shorter and more cupular. The nectariferous disk and trifid tendrils of *P. microcalyx* should readily distinguish it from all *Cydista* species. Gentry (1997) noted that the leaves of *Potamoganos microcalyx* are similar to those of *Distictella* Kuntze and *Ceratophytum* Pitt., but that the inflorescences and flowers more closely resemble *Mansoa* A. DC.

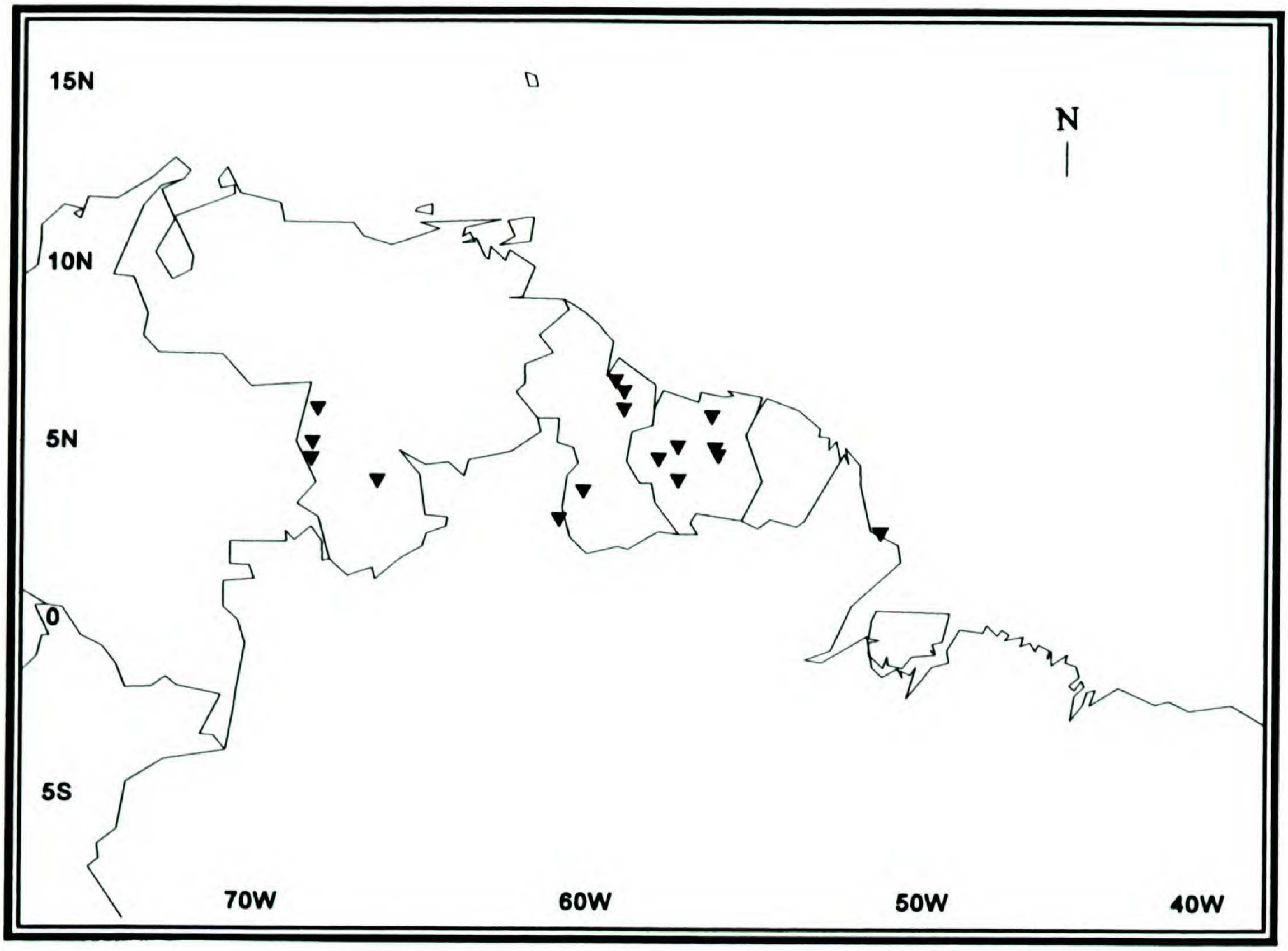

Figure 4. Geographic distribution of collections of *Potamoganos* in northern South America.

and *Roentgenia*. Like *Potamoganos*, *Roentgenia* has a trifid tendril, but the nectariferous disk is absent, and the bracts and bracteoles of *P. microcalyx* are not trisect, as is found in *Roentgenia*.

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Appendix 1

Index to numbered exsiccatae

Collections are listed alphabetically by the principal author, followed by collection number, and a boldface number (1–3) that indicates the species collected. All specimens entered into TROPICOS were assumed to have

been examined by A. H. Gentry. Specimens examined by the author were limited to duplicates housed at MO, and are indicated by a "!". The coding of the species numbers is as follows: *Roentgenia bracteomana* = **1**, *Roentgenia sordida* = **2**, *Potamoganos microcalyx* = **3**.

Archer, W. A. 8095 **2**; Aronson, J. 1039! **1**; Ayala, F. et al. 3927! **1**.

Balée, W. L. 1958 **1**, 1968 **2**, 3517! **2**; Beck, H. T. et al. 416! **2**; Benoist, R. 897! **2**; Black, G. A. 47–819 **2**; Boi, P. MG8796 **2**; Brandbyge, J. & Asanza, E. 30067! **1**; Burnham, R. J. 1563! **1**.

Cazalet, P. C. & Pennington 7558! **1**; Cerón, C. E. & Ayala, J. 9469! **1**; Cremers, G. 4502! **2**; Croat, T. B. 21259! **1**; Cruz, J. S. de la 2726! **3**; Cuatrecasas, J. 10834 **1**.

Davidse, G. & O. Huber 15362! **3**; Díaz S., C. & J. Ruiz 924! **1**; Díaz S., C. et al. 1297! **1**; dos Santos, G. et al. 73! **2**, 85! **2**, 118! **2**, 133! **2**; Ducke 1973 **3**.

Emmons, L. 21! **1**, 49! **1**, 133! **1**.

Feuillet, C. 2926! **2**; Florschutz, P. & Florschutz 1155 **3**; Florschutz, P. & Maas 2340, 2734 **3**; Foster, R. B. 9388! **1**; Foster, R. B. & B. d'Achille 12004! **1**; Froes, R. L. 31509 **2**.

Gentry, A. H. 13077! **2**, 49133! **2**; Gentry, A. H. & P. Berry 14938! **2**, 14970! **2**; Gentry, A. H. & Díaz, C. 58505! **1**; Gentry, A. H. & L. Emmons 39592! **1**; Gentry, A. H. & S. Estensoro 70344! **1**; Gentry, A. H. & R. Foster 70842! **1**; Gentry, A. H. & N. Jaramillo 57542! **1**, 57683! **1**; Gentry, A. H. & P. Núñez 59559 **1**, 69435! **1**, 69559! **1**; Gentry, A. H. & J. Revilla 16336! **1**; Gentry, A. H. & K. Young 31820! **1**; Gentry, A. H. et al. 9169! **1**, 10947! **3**; 21798! **1**, 22064! **1**, 23649! **1**, 25849! **1**, 26787! **1**, 27287! **1**, 45772! **1**, 46076! **1**, 68670! **1**, 76904! **1**, 76941! **1**; Graham, E. 307 **3**; Grewal 16 **3**; Grández, C. & A. Chiquispama 938! **1**.

Heyde, N. M. 449! **2**, 596! **2**; Heyde, N. M. & J. C. Lindeman 192! **3**; Holm-Nielsen, L. et al. 21432 **1**; Huashikat, V. 2158! **1**.

Jaramillo, J. & F. Coello 4433! **1**.

Killip, E. P. 37704 **2**; Killip, E. P. & A. C. Smith 28169 **1**; Klug, G. 2043! **1**, 2176! **1**; Kramer & Hekking 7450 **2**; Krukoff, B. A. 8623! **2**, 8847 **2**; Kujikat 357 **1**.

Lindeman, J. C. 4050 **2**, 5008 **2**, 5197 **2**; Linder, D. H. 80 **2**; Lowe, J. 410! **3**; Londoño, C. et al. 124! **3**; Lugo, H. 2557! **1**, 2570! **1**, 2703! **1**.

Maas, P. J. M. & L. Y. Th. Westra 3906! **3**; Maas, P. J. et al. 5573 **2**; Maguire, B. & L. Politi 28436 **3**; Maguire, B. et al. 29973 **3**; Marcano-Berti, L. 199! **2**; McDaniel, S. & B. Marcos 11000! **1**; Mexía, Y. 6320! **1**; Miller, J. S. & W. D. Hauk 9418! **3**; Mori, S. et al. 17251! **2**; Mori, S. & R. Souza 17263! **2**.

Neill, D. et al. 6283! **1**; Núñez, P. 6149! **1**, 11852! **1**, 12210! **1**; Núñez, P. & M. Timaná 12149A! **1**.

Oldeman, R. A. 2303 **2**; Øllgaard, B. et al. 34586! **1**.

Palacios, W. et al. 8717! **1**; Phillips, O. et al. 329! **1**; Pinkus 1! **2**; Pires, J. M. & N. T. Silva 11042 **2**, 11044 **2**; Plowman, T. & Schunke 7503! **1**; Prance, G. T. et al. 30271! **2**, 30306! **2**; Pulle, A. 170 **2**, 307 **3**, 415! **3**, 462pp **2**, 495 **2**.

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Sandwith, N. Y. 577 **2**; Schulz, J. 8371 **2**; Schunke V., J. 4608! **1**, 5696! **1**, 11788 **1**; Seibert, R. J. 2146! **1**; Siqueires, R. MG8824 **2**; Smith, A. C. 2847! **2**; Smith, D. N. et al. 13258! **1**, 14115! **1**; Smith, S. F. & Shuhler 400! **1**; Smith, S. F. et al. 620! **1**, 1454! **1**; Steege, H. et al. 357! **3**; Stergios, B. 10320! **2**; Stergios, B. & L. Delgado 12998! **2**.

Tessmann, G. 3245 **1**; Tillett, S. S. & Tillett 45685! **2**; Timaná, M. & P. Smith 1426! **1**; Timaná, M. & O. Phillips 1881! **1**.

Ule, E. 5497 **1**.

Woytkowski, F. 5637! **1**.

Young, K. 25! **1**; Young, H. J. & D. A. Stratton 3! **1**.

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